MEASUREMENT REPORT

FCC PART 96

FCC ID:	ZMOFM101GL
Applicant:	Fibocom Wireless Inc.
Application Type:	Certification
Product:	LTE Module
Model No.:	FM101-GL
Brand Name:	Fibocom
FCC Rule Part(s):	Part 96
Test Procedure(s):	ANSI C63.26: 2015
Test Date:	October 25 ~ December 22, 2021

Reviewed By: Sunny Sun

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

Revision History

Report No.	Version	Description	Issue Date	Note
2110RSU029-U1	Rev. 01	Initial Report	12-17-2021	Invalid
2110RSU029-U1	Rev. 02	Added the full EIRP and corrected the calibration date of equipment	12-22-2021	Valid

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Description Page

1. GENERAL INFORMATION

1.1. Applicant

Fibocom Wireless Inc.

1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China

1.2. Manufacturer

Fibocom Wireless Inc.

1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China **Laboratory Location (Suzhou - SIP)** 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China
	Laboratory Accreditations
	A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐R-20025 ☐G-20034 ☐C-20020 ☐T-20020 ☐R-20141 ☐G-20134 ☐C-20103 ☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	Laboratory Accreditations
	A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	**Test Site – MRT Taiwan Laboratory**
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	Laboratory Accreditations
	TAF: L3261-190725 FCC: 291082, TW3261 ISED: TW3261

2. PRODUCT INFORMATION

2.1. Product Information

Product Name	LTE Module
Model No.	FM101-GL
Brand Name	Fibocom
IMEI	Conducted Measurement: 861023050011477 & 861023050010677 Radiated Measurement: 861023050010610 & 861023050010677
Operating Temperature	-10 ~ 55 °C
Power Type	3.135 ~ 4.4Vdc, typical 3.3Vdc
Antenna Information	Refer to Section 2.3
UMTS Specification	
Single Band	Band 2, 4, 5
Modulation	Uplink up to 16QAM, Downlink up to 64QAM
E-UTRA Specification	
Single Band	Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 30, 38, 41, 48, 66, 71
HPUE Band	Band 41
Modulation	Uplink up to 16QAM, Downlink up to 64QAM

Note: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.

2.2. Radio Specification under Test

TDD T_X & R_X Frequency Range	Band 48: 3550 ~ 3700 MHz
Device Type	End User Device

Note: For other features of this EUT, test reports will be issued separately.

2.3. Description of Available Antennas

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
LTE Band 2	1850 ~ 1910	PIFA	4.00
LTE Band 4	1710 ~ 1755		3.00
LTE Band 5	824 ~ 849		3.00
LTE Band 7	2500 ~ 2570		4.00
LTE Band 12	699 ~ 716		3.00
LTE Band 13	777 ~ 787		3.00
LTE Band 14	788 ~ 798		3.00
LTE Band 17	704 ~ 716		3.00
LTE Band 25	1850 ~ 1915		4.00
LTE Band 26	814 ~ 849		3.00
LTE Band 30	2305 ~ 2315		1.00
LTE Band 38	2570 ~ 2620		4.00
LTE Band 41	2500 ~ 2690		4.00
LTE Band 48	3550 ~ 3700		1.00
LTE Band 66	1710 ~ 1780		3.00
LTE Band 71	663 ~ 698		3.00

2.4. Test Methodology

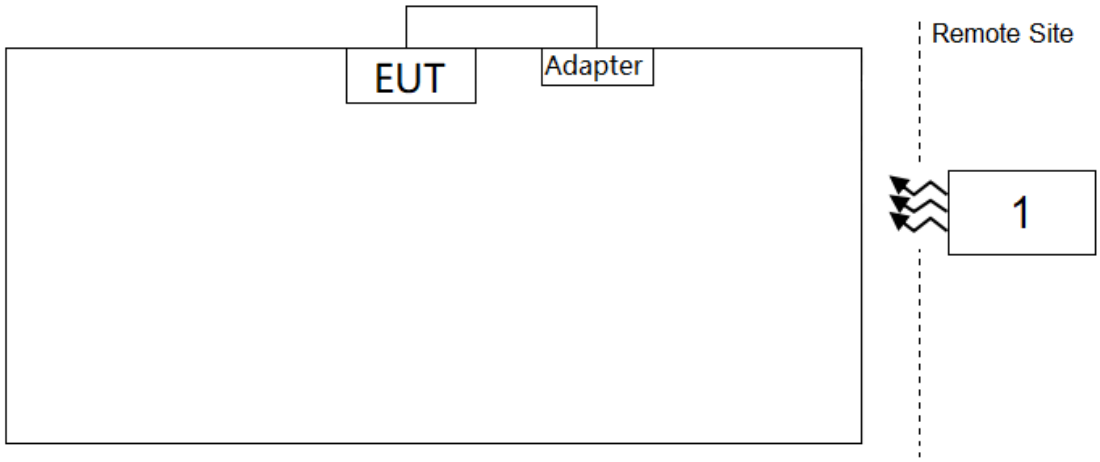
According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.26:2015
- FCC CFR 47 Part 96
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP
- FCC KDB 940660 D01 Part 96 CBRS v03
- WINNF-TS-0122 V1.0.2: Test and Certification for Citizens Broadband Radio Service (CBRS); Conformance and Performance Test Technical Specification; CBSD/DP as Unit Under Test (UUT)

2.5. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

2.6. Configuration of Tested System



Product		Manufacturer	Model No.
1	Wideband Radio Communication Tester	R&S	CMW 500

2.7. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20% ~ 75%RH

3. TEST EQUIPMENT CALIBRATION DATE

Instrument Name	Manufacturer	Model No.	Asset No.	Cali. Interval	Cal. Due Date	Test Site
Communication Tester	R&S	CMU 200	MRTSUE06009	1 year	2022/9/7	SIP-SR1
Communication Tester	R&S	CMW500	MRTSUE06243	1 year	2022/10/10	SIP-SR1
Signal Generator	Keysight	E8257D	MRTSUE06453	1 year	2022/6/24	SIP-SR1
Thermohygrometer	testo	622	MRTSUE06629	1 year	2021/11/25	SIP-SR1
Thermohygrometer	testo	622	MRTSUE06629	1 year	2022/11/2	SIP-SR1
Signal Generator	Keysight	E8257D	MRTSUE06904	1 year	2021/12/08	SIP-SR1
Signal Generator	Keysight	E8257D	MRTSUE06904	1 year	2022/11/23	SIP-SR1
DC POWER MODULE	Keysight	N6743B	MRTSUE06905	/	/	SIP-SR1
DC POWER MODULE	Keysight	N6743B	MRTSUE06906	/	/	SIP-SR1
Low-Profile Modular Power System Mainframe	Keysight	N6700C	MRTSUE06907	/	/	SIP-SR1
Signal Analyzer	Keysight	N9021B	MRTSUE06915	1 year	2022/1/18	SIP-SR1
Temperature Chamber	BAOYT	BYG-80CL	MRTSUE06932	1 year	2022/3/16	SIP-SR1
Shielding Room	MIX-BEP	SIP-SR1	MRTSUE06948	/	/	SIP-SR1
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2022/1/12	SIP-AC2
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2022/6/24	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06599	1 year	2022/10/20	SIP-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2022/10/11	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06623	1 year	2021/12/3	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06623	1 year	2022/11/28	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06624	1 year	2021/12/3	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06624	1 year	2022/11/28	SIP-AC2
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2021/11/9	SIP-AC2
Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2022/11/8	SIP-AC2
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06647	1 year	2022/8/5	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06648	1 year	2021/11/26	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06648	1 year	2022/11/9	SIP-AC2
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2021/12/24	SIP-AC2

Software	Version	Function
EMI Software	V3	EMI Test Software

4. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Radiated Spurious Emissions
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 9kHz ~ 300MHz: 5.04dB 300MHz ~ 1GHz: 4.95dB 1GHz ~ 40GHz: 6.40dB Vertical: 9kHz ~ 300MHz: 5.24dB 300MHz ~ 1GHz: 6.03dB 1GHz ~ 40GHz: 6.40dB
Conducted Spurious Emissions
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%
Frequency Stability
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 76.2Hz

5. TEST RESULT

5.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	Conducted	Pass	Section5.2
2.1055	Frequency Stability	Refer to section 5.3		Pass	Section5.3
96.41(b)	Equivalent Isotropic Radiated Power	Refer to section 5.4		Pass	Section5.4
2.1051 96.41(e)	Spurious Emission; Band Edge Emission	Refer to section 5.5, 5.6		Pass	Section 5.5, 5.6
2.1053, 96.41(e)	Spurious Emission	Refer to section 5.7	Radiated	Pass	Section5.7
96.47	End User Device Additional Requirements (CBSD Protocol)	Refer to section 5.8		Pass	Section5.8

Notes:

1) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part ofthe system to connect the EUT to the analyzer at all frequencies of interest.
2) Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations the worst-case was found.
3) All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Band Edge, Radiated & Conducted SpuriousEmission were presented worst case in the test report.

5.2. Occupied Bandwidth Measurement

5.2.1.Test Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

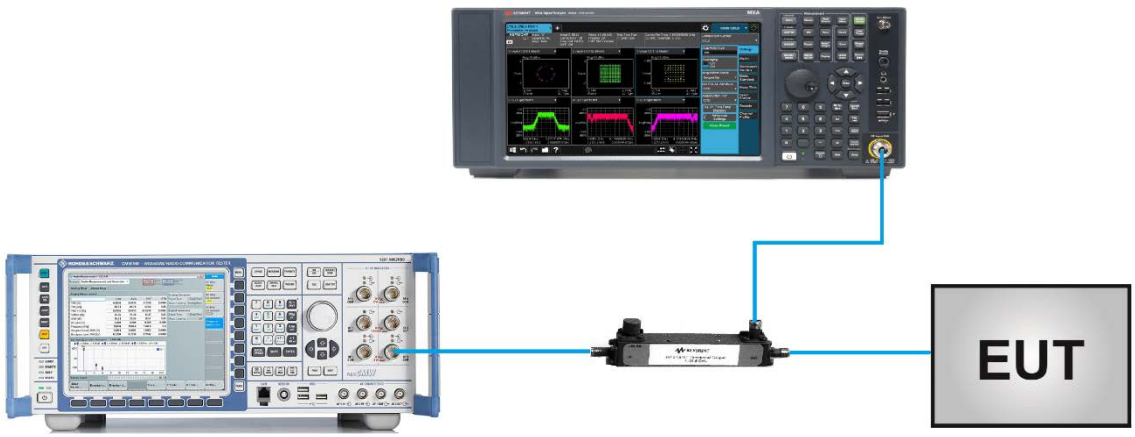
5.2.2.Test Procedure

ANSI C63.26-2015 - Section 5.4

5.2.3.Test Setting

1. Set center frequency to the nominal EUT channel center frequency
2. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

5.2.4.Test Setup



5.2.4.1. Test Result

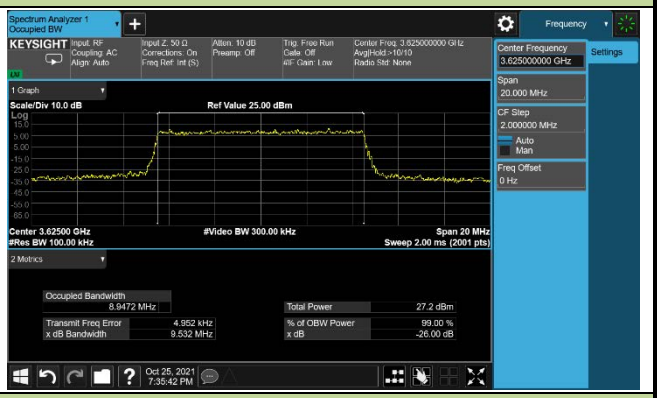
Product	LTE Module	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/10/25
Test Band	LTE Band 48		

Modulation	Frequency (MHz)	Bandwidth (MHz)	99% Bandwidth (MHz)
QPSK	3625.0	5	4.47
		10	8.95
		15	13.39
		20	17.86
16QAM	3625.0	5	4.37
		10	8.95
		15	13.41
		20	17.86

99% Bandwidth - QPSK

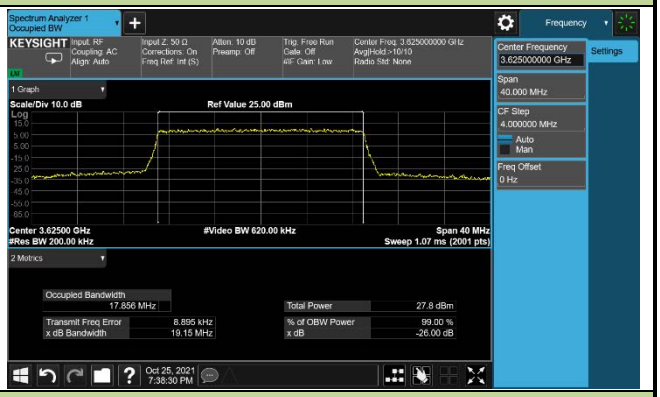
5MHz Channel Bandwidth

10MHz Channel Bandwidth



15MHz Channel Bandwidth

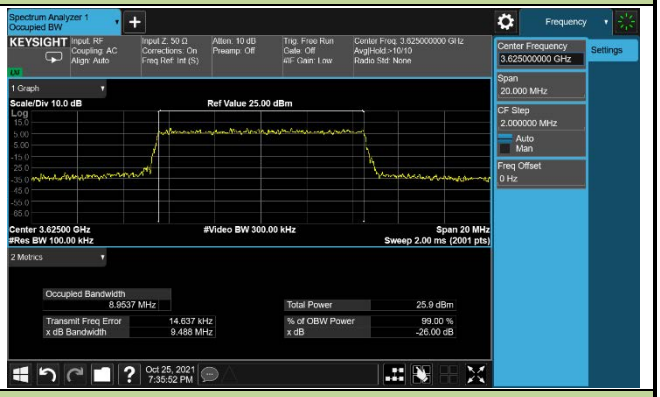
20MHz Channel Bandwidth



99% Bandwidth -16QAM

5MHz Channel Bandwidth

10MHz Channel Bandwidth



15MHz Channel Bandwidth

20MHz Channel Bandwidth

5.3. Frequency Stability Measurement

5.3.1.Test Limit

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5ppm) of the center frequency.

5.3.2.Test Procedure

ANSI C63.26-2015 - Section 5.6

5.3.3.Test Setting

Frequency Stability Under Temperature Variations:

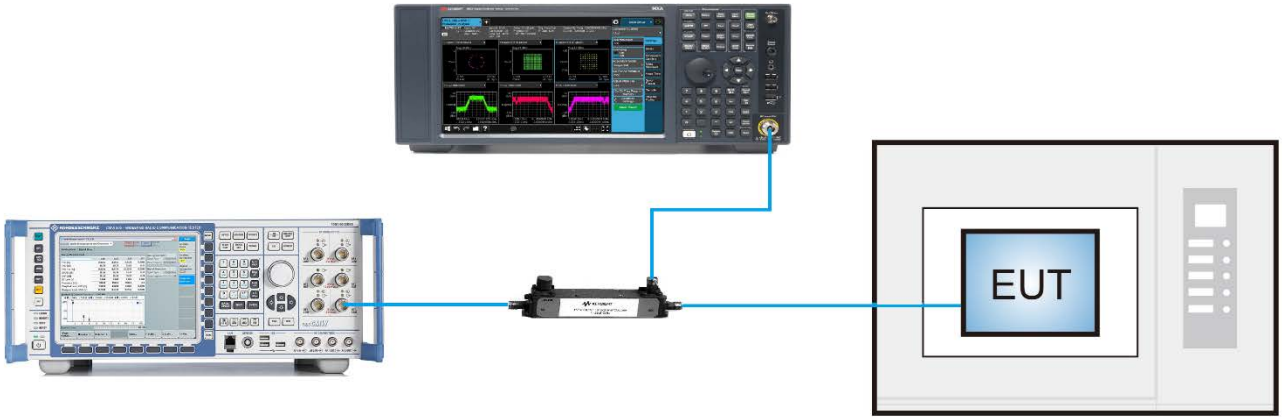
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the inputvoltage to specify extreme voltage variation (±15%) and endpoint, recordthe maximum frequency change.

5.3.4.Test Setup



5.3.5.Test Result

Product	LTE Module	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/11/11
Test Band	LTE Band 48		

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.3	- 30	-0.0041
	- 20	0.0036
	- 10	-0.0038
	0	-0.0030
	+ 10	0.0034
	+ 20	0.0039
	+ 30	-0.0038
	+ 40	0.0035
	+ 50	-0.0031
4.4	+ 20	-0.0026
3.135	+ 20	-0.0028

5.4. Equivalent Isotropically Radiated Power Measurement

5.4.1.Test Limit

The maximum effective isotropic radiated power (EIRP) End User Device is 23dBm/10MHz

5.4.2.Test Procedure

ANSI C63.26-2015 - Section 5.2.4.4.2 & 5.2.5.5

5.4.3.Test Setting

When the fundamental condition for average power measurements cannot be realized (i.e., the EUT can not be configured to transmit at full-power on a continuous basis (i.e., duty cycle < 98%) and the instrumentation cannot be configured to measure only during active full-power transmissions), then thefollowing procedure can be used if the EUT duty cycle is constant (i.e., duty cycle variations are less thanor equal to ±2%).

a) Set span to 2 × to 3 × the OBW.

b) Set RBW = 1% to 5% of the OBW.

c) Set VBW ≥ 3 × RBW.

d) Set number of measurement points in sweep ≥ 2 × span / RBW.

e) Sweep time:

1) Set = auto-couple, or

2) Set ≥ [10 × (number of points in sweep) × (transmission symbol period)] for single sweep (automation-compatible) measurement.

f) Detector = power averaging (rms).

g) Set sweep trigger to “free run.”

h) Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

i) Using the marker function to identify the maximum PSD.

j) Add 10 log (1/duty cycle) to the measured power level to compute the average power during continuous transmission. For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is a constant 25%.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output

power is given in Equation (1) as follows:

ERP or EIRP = P_{Meas} + G_T (1)

where

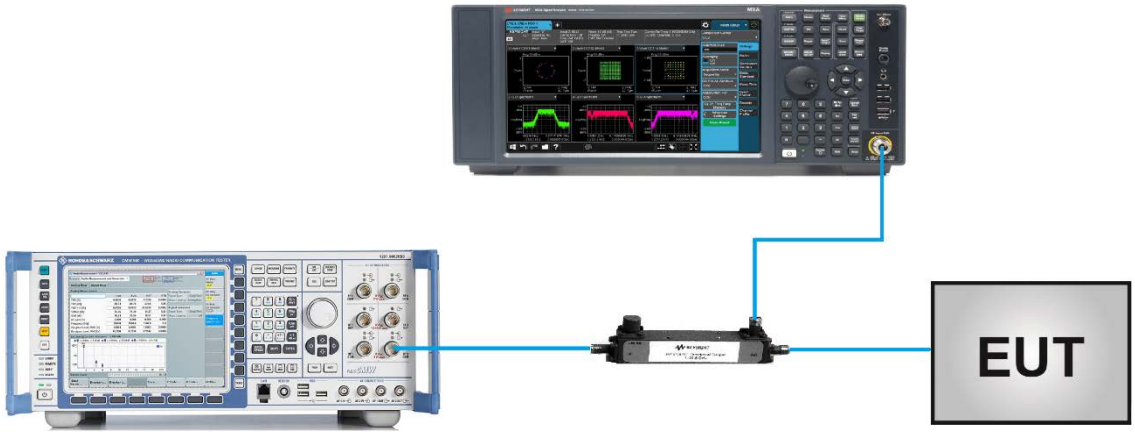
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

For devices utilizing multiple antennas, see 6.4 for guidance with respect to determining the effective array transmit antenna gain term to be used in the above equation.

5.4.4.Test Setup



5.4.5.Test Result

Product	LTE Module	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/10/25
Test Band	LTE Band 48		

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm/10MHz)	EIRP (dBm/ 10MHz)	Limit (dBm/ 10MHz)
QPSK							
55265	3552.50	5	25	0	19.07	20.07	< 23.00
55900	3625.00				20.06	21.06	< 23.00
56715	3697.50				19.57	20.57	< 23.00
55290	3555.00	10	50	0	19.26	20.26	< 23.00
55900	3625.00				19.90	20.90	< 23.00
56690	3695.00				19.64	20.64	< 23.00
55315	3557.50	15	75	0	18.19	19.19	< 23.00
55990	3625.00				18.49	19.49	< 23.00
56665	3692.50				18.30	19.30	< 23.00
55340	3560.00	20	100	0	16.97	17.97	< 23.00
55990	3625.00				17.27	18.27	< 23.00
56640	3690.00				17.17	18.17	< 23.00
16QAM							
55265	3552.50	5	25	0	18.04	19.04	< 23.00
55900	3625.00				18.29	19.29	< 23.00
56715	3697.50				18.27	19.27	< 23.00
55290	3555.00	10	50	0	18.76	19.76	< 23.00
55900	3625.00				18.59	19.59	< 23.00
56690	3695.00				18.49	19.49	< 23.00
55315	3557.50	15	75	0	17.58	18.58	< 23.00
55990	3625.00				17.32	18.32	< 23.00
56665	3692.50				17.57	18.57	< 23.00
55340	3560.00	20	100	0	15.70	16.70	< 23.00
55990	3625.00				16.40	17.40	< 23.00
56640	3690.00				16.22	17.22	< 23.00
Note: The EIRP (dBm/10MHz) = Output Power (dBm/10MHz) + Antenna Gain (dBi)							

Product	LTE Module	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/12/22
Test Band	LTE Band 48		

Channel No.	Frequency (MHz)	Channel Bandwidth (MHz)	RB Size	RB Offset	Output Power (dBm)	EIRP (dBm)	Limit (dBm)
QPSK							
55315	3557.50	15	75	0	19.54	20.54	N/A
55990	3625.00				20.00	21.00	N/A
56665	3692.50				20.11	21.11	N/A
55340	3560.00	20	100	0	19.50	20.50	N/A
55990	3625.00				20.01	21.01	N/A
56640	3690.00				20.05	21.05	N/A
16QAM							
55315	3557.50	15	75	0	18.40	19.40	N/A
55990	3625.00				19.03	20.03	N/A
56665	3692.50				19.13	20.13	N/A
55340	3560.00	20	100	0	18.46	19.46	N/A
55990	3625.00				19.00	20.00	N/A
56640	3690.00				19.09	20.09	N/A
Note 1: The EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi); Note 2: The EIRP is reported for the grant output power.							

5.5. Band Edge Measurement

5.5.1.Test Limit

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated, and the worst-case configuration results are reported in this section.

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

5.5.2.Test Procedure

ANSI C63.26-2015 - Section5.7

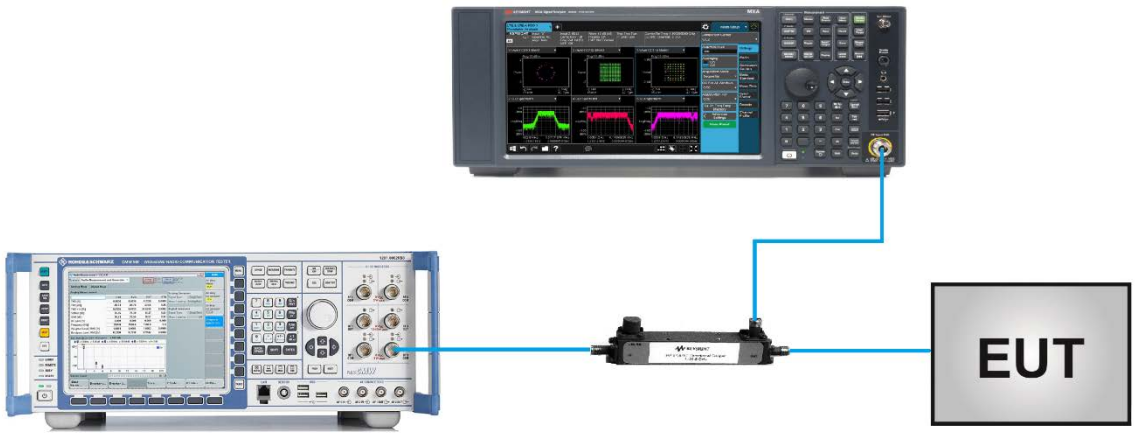
5.5.3.Test Setting

1. Set the analyzer frequency to low, middle, high channel.
2. RBW ≥ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW narrower than the specified reference bandwidth can be used (generally limited to no less than 1% of the OBW), provided that a subsequent integration is performed over the full required measurement bandwidth. This integration should be performed using the spectrum analyzer's band power functions.
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to "free run."
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full

power

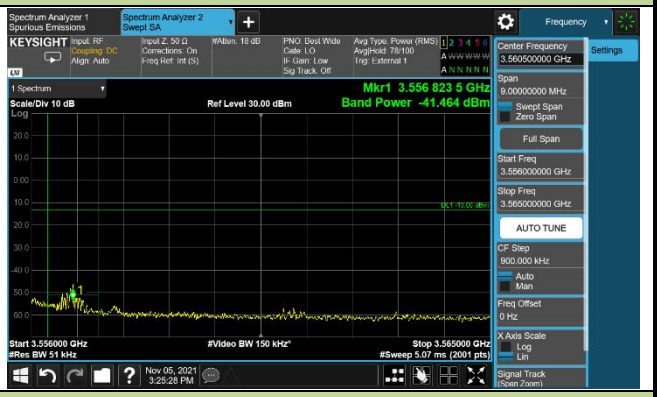
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.
9. Used power integration whenusing a measurement bandwidth smaller than the specified bandwidth.

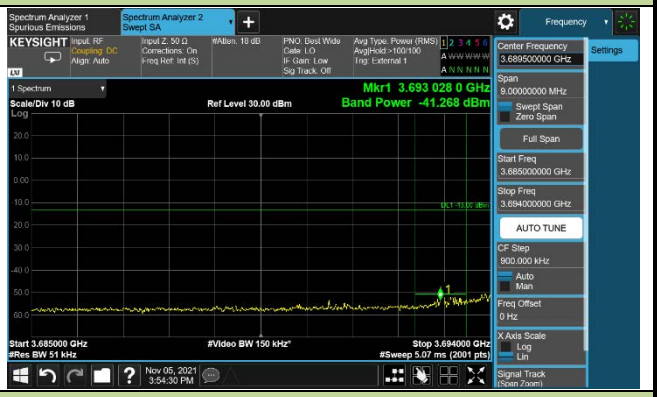
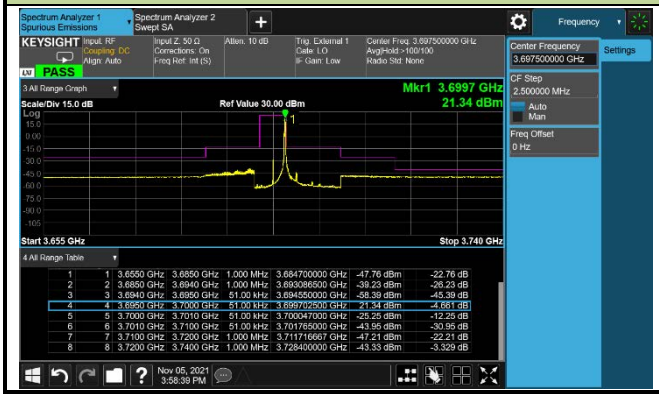
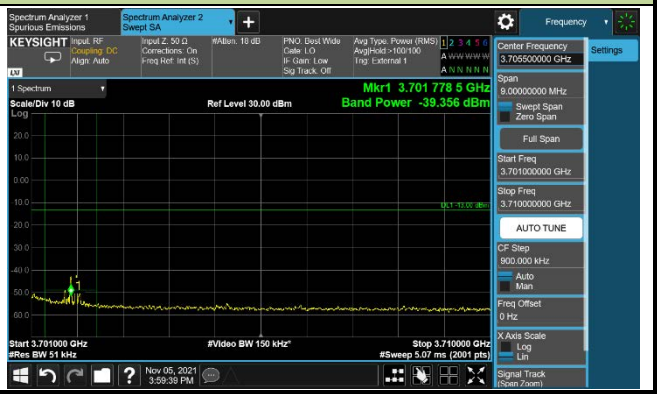
5.5.4.Test Setup

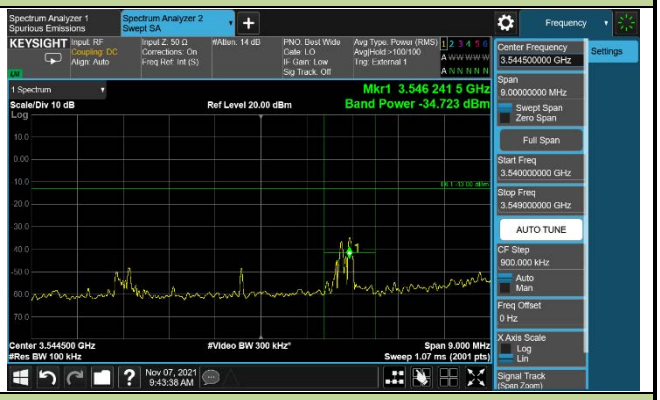
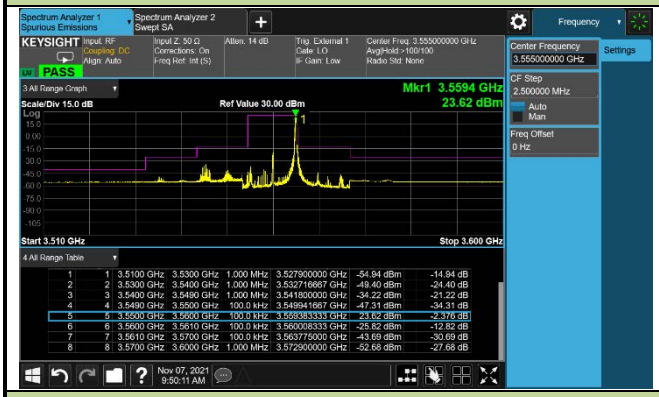
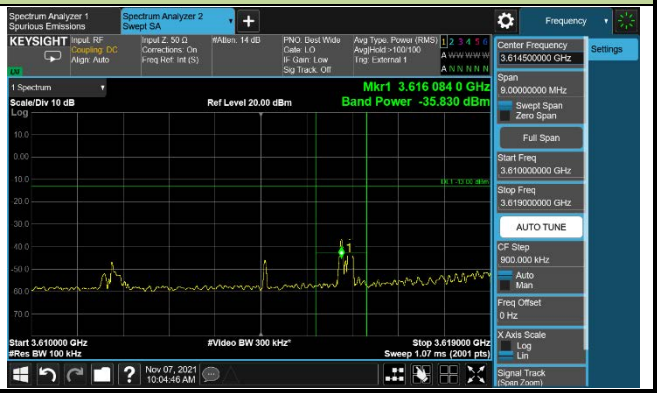


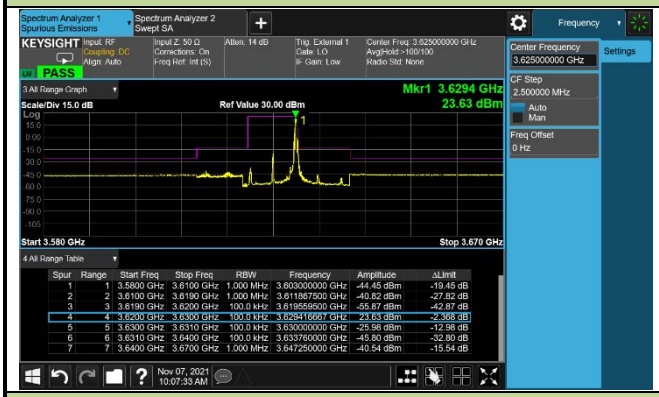
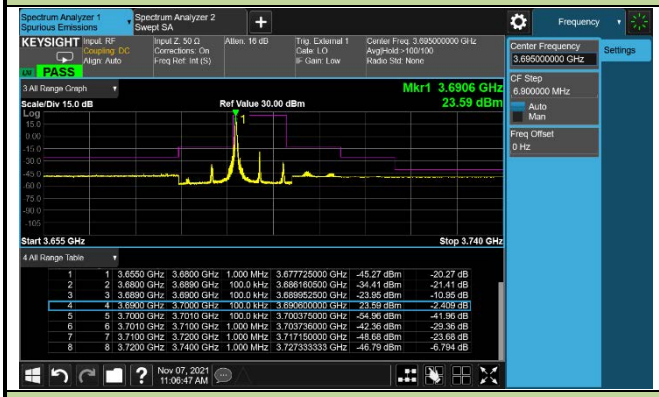
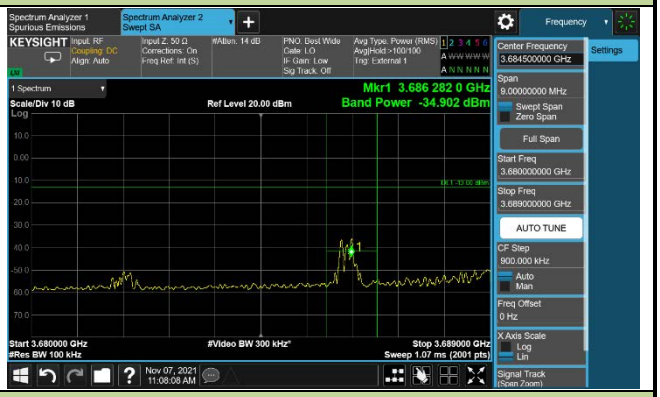
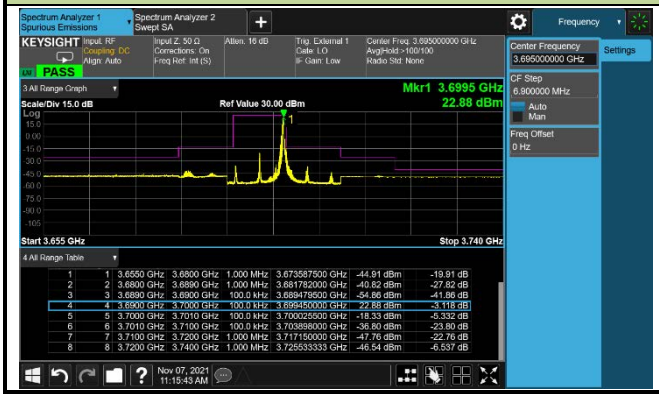
5.5.5.Test Result

Product	LTE Module	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/11/05 ~ 2021/11/23
Test Band	LTE Band 48_QPSK	Test Result	Pass

5MHz Channel Bandwidth - 1RB	
Low Channel ACP - Low RB Position	Extended Band Edge
	
Low Channel ACP - High RB Position	Extended Band Edge
	
Middle Channel ACP - Low RB Position	Extended Band Edge
	

Middle Channel ACP - High RB Position	Extended Band Edge
	
High Channel ACP - Low RB Position	**Extended Band Edge**
	
High Channel ACP - High RB Position	**Extended Band Edge**
	

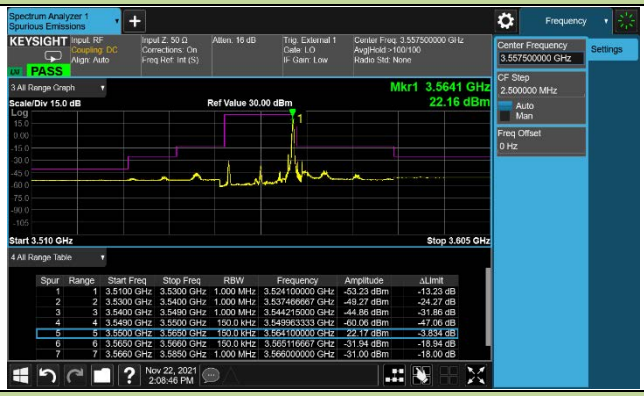
10MHz Channel Bandwidth - 1RB	
Low Channel ACP - Low RB Position	Extended Band Edge
	
Low Channel ACP - High RB Position	Extended Band Edge
	
Middle Channel ACP - Low RB Position	Extended Band Edge
	

Middle Channel ACP - High RB Position	Extended Band Edge
	
High Channel ACP - Low RB Position	**Extended Band Edge**
	
High Channel ACP - High RB Position	**Extended Band Edge**
	

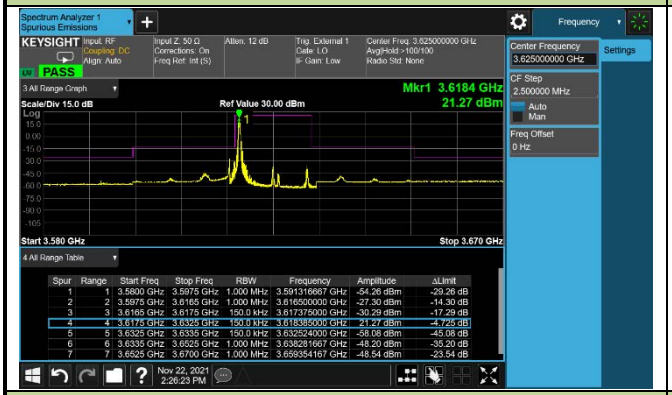
15MHz Channel Bandwidth - 1RB

Low Channel ACP - Low RB Position

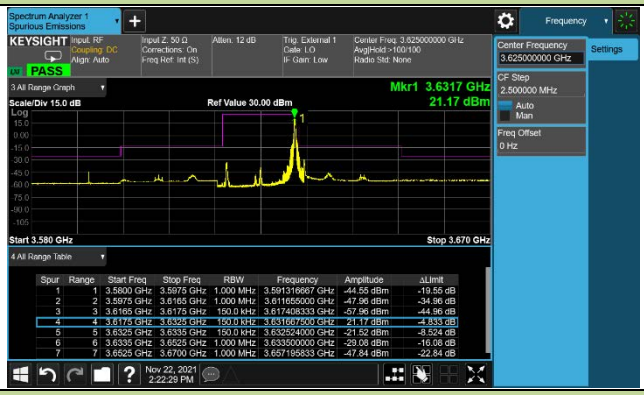
Low Channel ACP - High RB Position



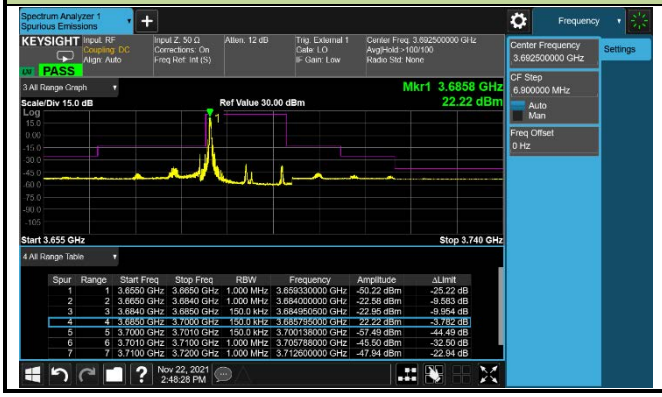
Middle Channel ACP - Low RB Position



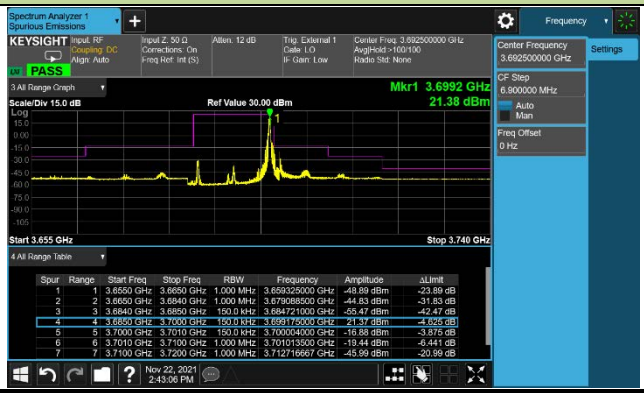
Middle Channel ACP - High RB Position



High Channel ACP - Low RB Position

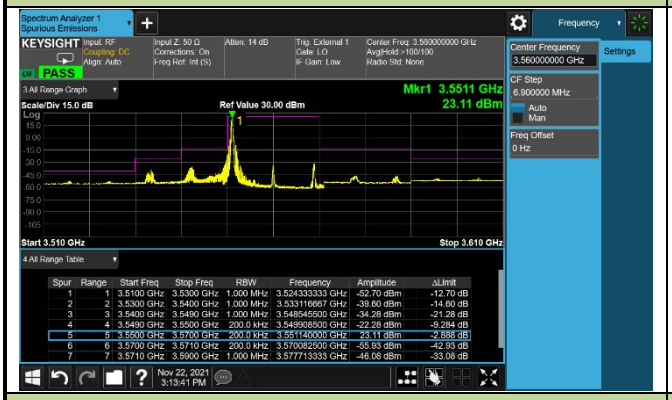


High Channel ACP - High RB Position

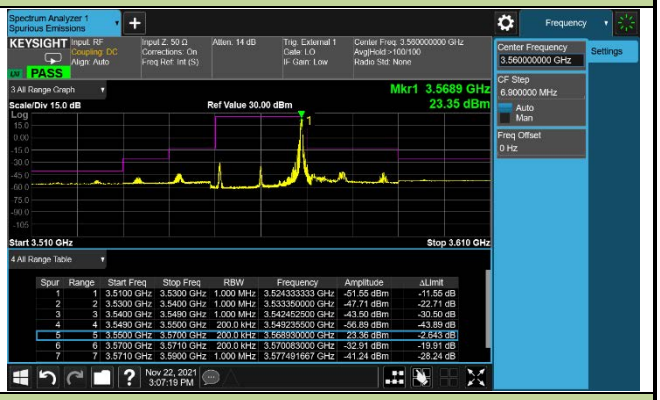


20MHz Channel Bandwidth - 1RB

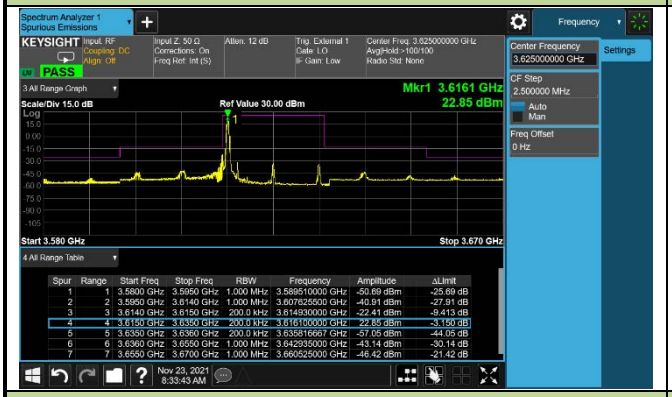
Low Channel ACP - Low RB Position



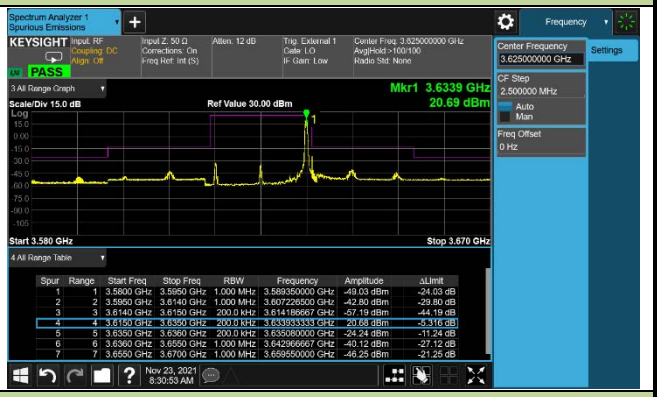
Low Channel ACP - High RB Position



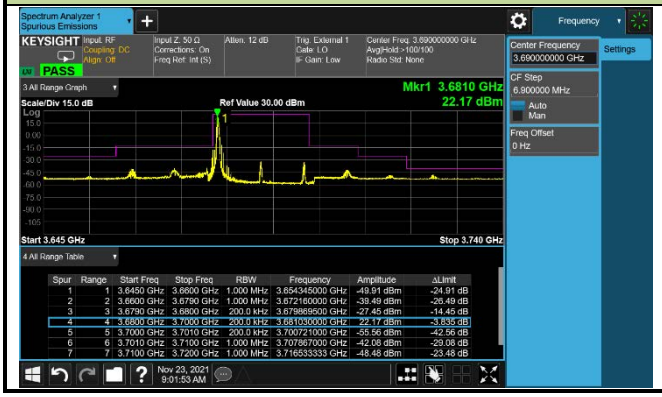
Middle Channel ACP - Low RB Position



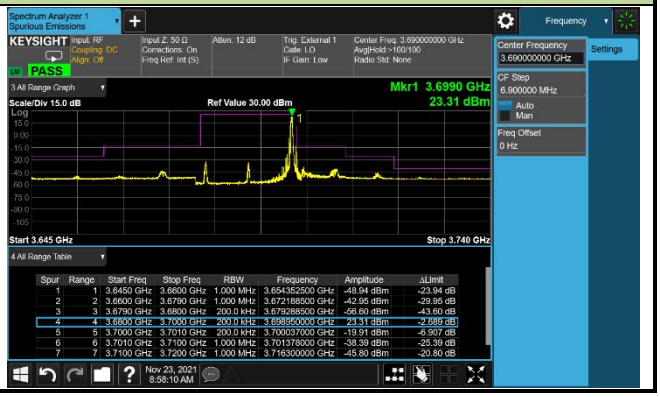
Middle Channel ACP - High RB Position

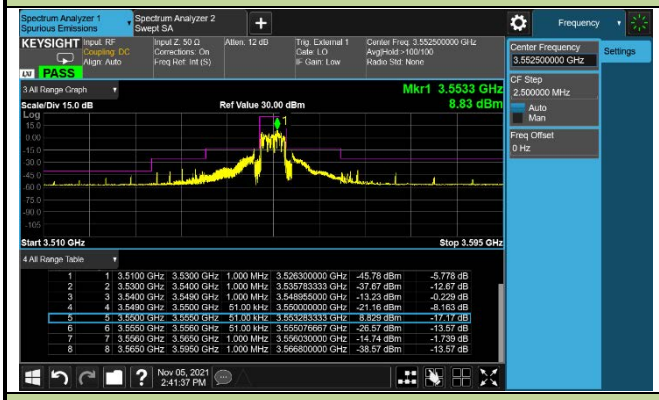
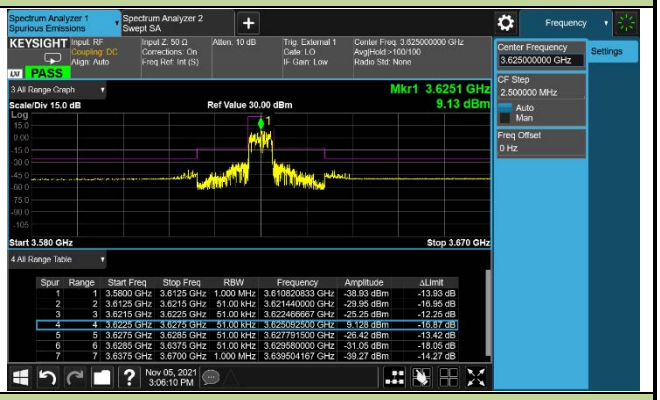
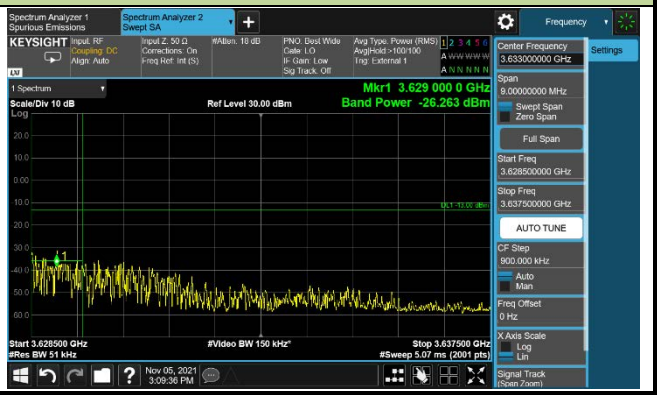


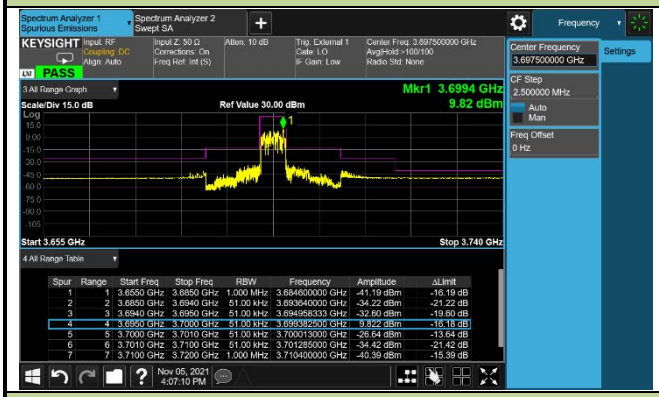
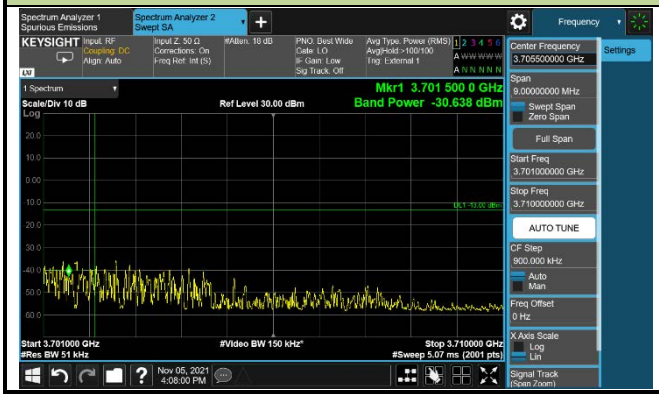
High Channel ACP - Low RB Position

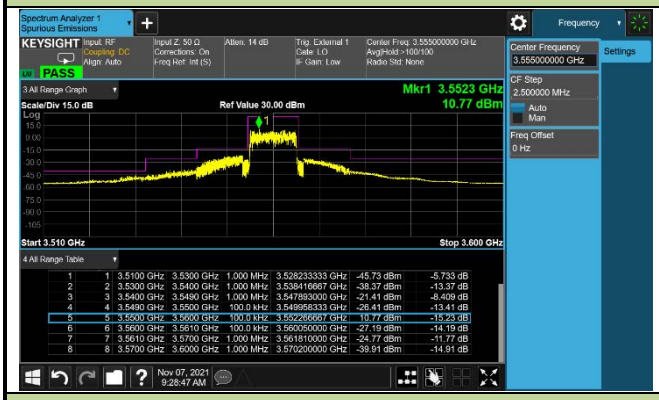
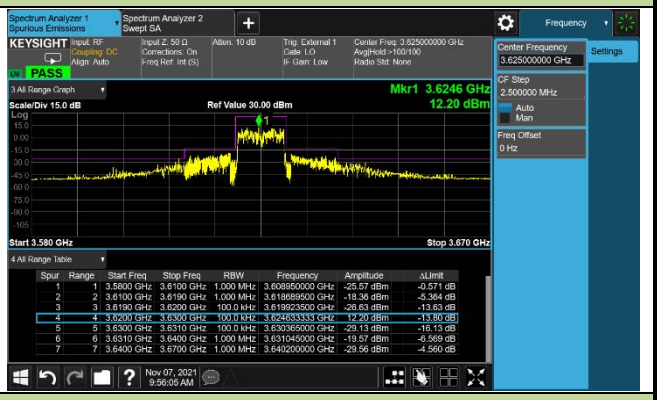
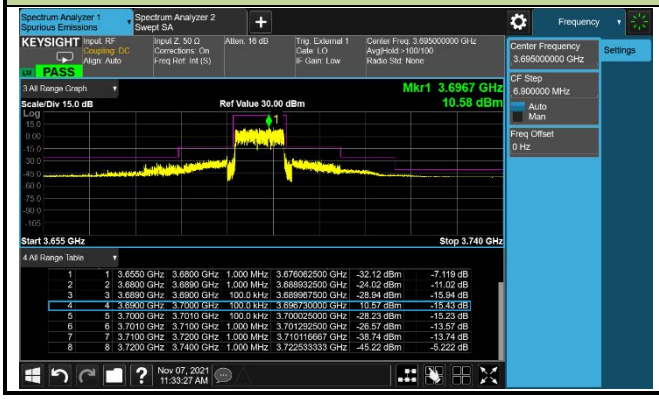


High Channel ACP - High RB Position

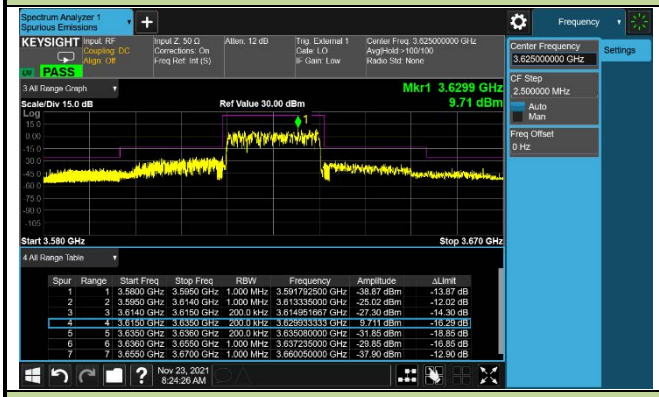


5MHz Channel Bandwidth - Full RB	
Low Channel ACP	Middle Channel ACP
	
Extended Band Edge (3612.5 Mhz ~ 3621.5Mhz)	Extended Band Edge (3628.5 Mhz ~ 3637.5Mhz)
	

High Channel ACP	Extended Band Edge (3685Mhz ~ 3694Mhz)
	
Extended Band Edge (3701Mhz ~ 3710Mhz)	
	

10MHz Channel Bandwidth - Full RB	
Low Channel ACP	Middle Channel ACP
	
High Channel ACP	
	

15MHz Channel Bandwidth - Full RB	
Low Channel ACP	
	
Middle Channel ACP	
	
High Channel ACP	
	

20MHz Channel Bandwidth - Full RB	
Low Channel ACP	
	
Middle Channel ACP	
	
High Channel ACP	
	

5.6. Conducted Spurious Emission Measurement

5.6.1.Test Limit

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated, and the worst-case configuration results are reported in this section.
The conducted power of any emissions below 3530MHz or above 3720MHz shall not exceed -40dBm/MHz.

5.6.2.Test Procedure

ANSI C63.26-2015 - Section 5.7

5.6.3.Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power.
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

5.6.4.Test Setup

5.6.5.Test Result

Product	LTE Module	Test Site	SIP-SR1
Test Engineer	Candy Luo	Test Date	2021/10/28
Test Band	LTE Band 48_QPSK		

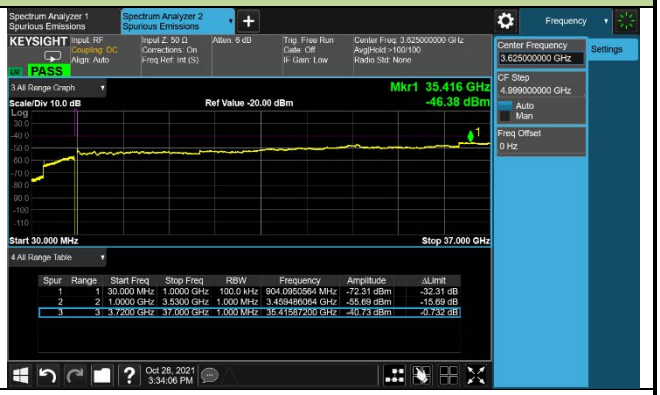
Channel	Frequency (MHz)	Channel Bandwidth (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm/MHz)	Limit (dBm/ MHz)	Result
55265	3552.5	5	30 ~ 40000	-40.56	≤ -40.00	Pass
55900	3625.0	5	30 ~ 40000	-40.73	≤ -40.00	Pass
56715	3697.5	5	30 ~ 40000	-42.72	≤ -40.00	Pass
55290	3555.0	10	30 ~ 40000	-42.11	≤ -40.00	Pass
55900	3625.0	10	30 ~ 40000	-43.11	≤ -40.00	Pass
56690	3695.0	10	30 ~ 40000	-41.17	≤ -40.00	Pass
55315	3557.5	15	30 ~ 40000	-42.32	≤ -40.00	Pass
55900	3625.0	15	30 ~ 40000	-43.15	≤ -40.00	Pass
56665	3692.5	15	30 ~ 40000	-42.51	≤ -40.00	Pass
55340	3550.0	20	30 ~ 40000	-42.87	≤ -40.00	Pass
55900	3625.0	20	30 ~ 40000	-41.72	≤ -40.00	Pass
56640	3690.0	20	30 ~ 40000	-42.24	≤ -40.00	Pass

Note: Spurious emissions within 9kHz – 30MHz were found more than 20dB below limit line.

5MHz Channel Bandwidth

Low Channel

Middle Channel



High Channel

10MHz Channel Bandwidth

Low Channel

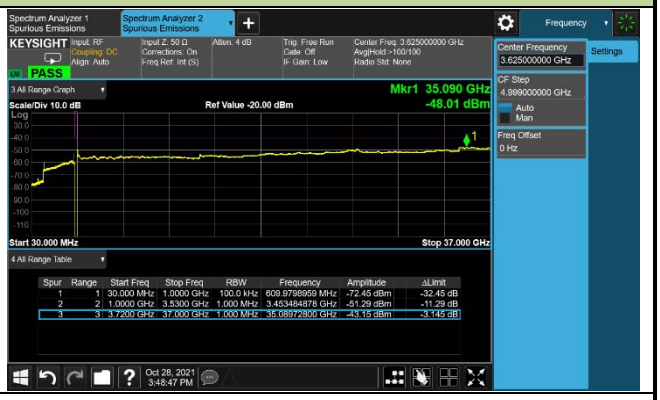
Middle Channel

High Channel

15MHz Channel Bandwidth

Low Channel

Middle Channel



High Channel

20MHz Channel Bandwidth

Low Channel

Middle Channel

High Channel

5.7. Radiated Spurious Emission Measurement

5.7.1.Test Limit

Out of band emissions: The power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz.

E (dBμV/m) = EIRP (dBm) - 20 log D + 104.8; where D is the measurement distance in meters. The emission limit equal to 55.3dBμV/m.

5.7.2.Test Procedure

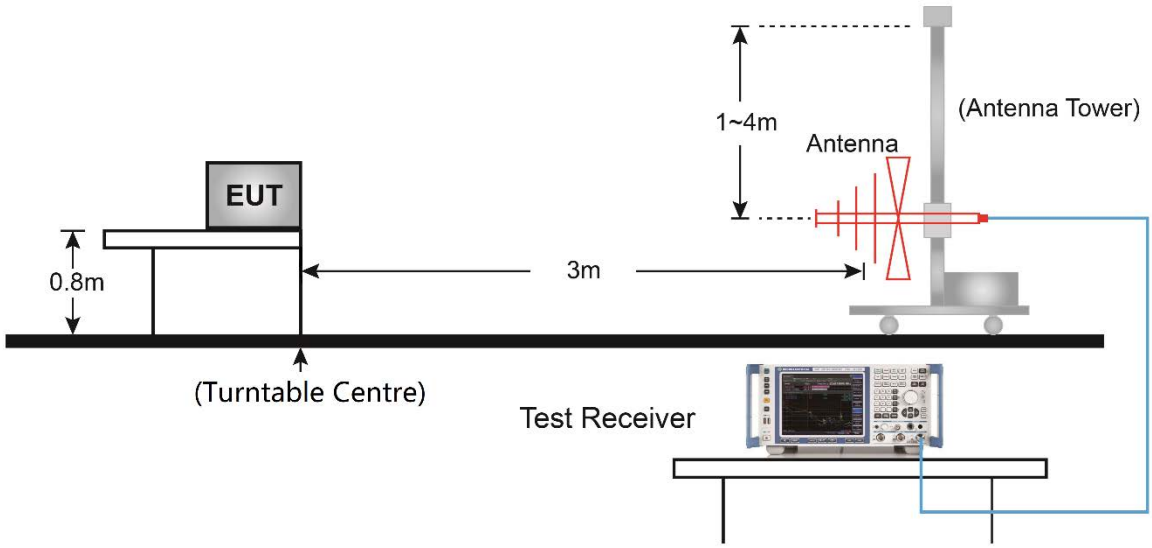
ANSI C63.26-2015 - Section 5.2.7 & 5.5

5.7.3.Test Setting

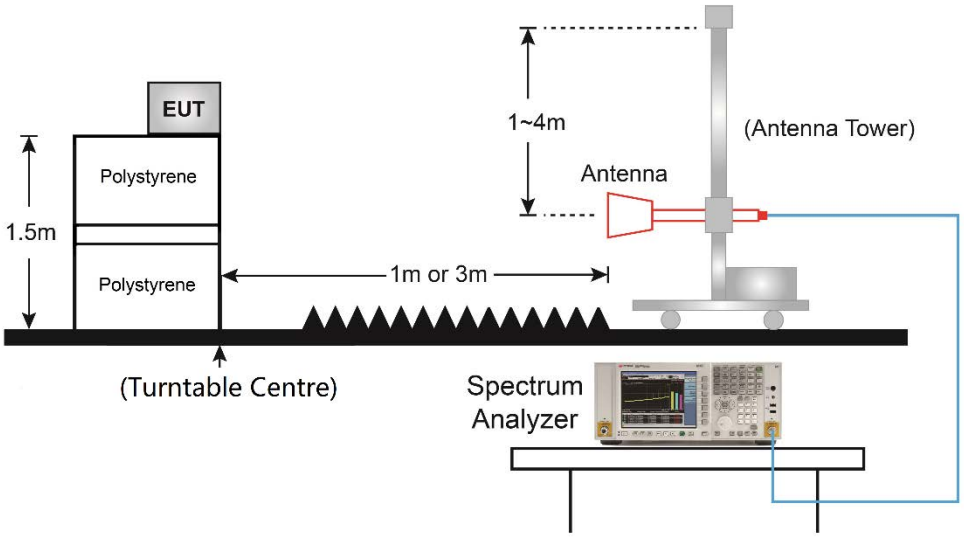
1. RBW = 1MHz
2. VBW ≥ 3*RBW
3. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

5.7.4.Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.7.5.Test Result

Product	LTE Module	Test Site	SIP-AC2
Test Engineer	Allen Zou	Test Date	2021/11/04 ~ 2021/11/13
Test Mode	LTE Band 48_5MHz_1RB_QPSK		

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level(dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
66.9	16.6	17.0	33.6	55.3	-21.7	Peak	Horizontal
952.5	2.5	30.5	33.0	55.3	-22.3	Peak	Horizontal
30.0	20.4	16.9	37.3	55.3	-18.0	Peak	Vertical
66.4	20.7	17.1	37.8	55.3	-17.5	Peak	Vertical
7417.5	49.7	-7.5	42.2	55.3	-13.1	Peak	Horizontal
9942.0	48.6	-5.3	43.3	55.3	-12.0	Peak	Horizontal
7103.0	53.0	-7.8	45.2	55.3	-10.1	Peak	Vertical
9245.0	49.1	-5.7	43.4	55.3	-11.9	Peak	Vertical
Middle Channel							
66.4	16.2	17.1	33.3	55.3	-22.0	Peak	Horizontal
988.8	2.8	31.1	33.9	55.3	-21.4	Peak	Horizontal
30.0	20.3	16.9	37.2	55.3	-18.1	Peak	Vertical
66.9	18.3	17.0	35.3	55.3	-20.0	Peak	Vertical
7247.5	51.2	-7.6	43.6	55.3	-11.7	Peak	Horizontal
9194.0	48.9	-5.7	43.2	55.3	-12.1	Peak	Horizontal
7247.5	56.8	-7.6	49.2	55.3	-6.1	Peak	Vertical
10868.5	55.4	-5.6	49.8	55.3	-5.5	Peak	Vertical
High Channel							
67.3	16.5	16.9	33.4	55.3	-21.9	Peak	Horizontal
998.5	2.1	31.2	33.3	55.3	-22.0	Peak	Horizontal
30.0	20.5	16.9	37.4	55.3	-17.9	Peak	Vertical
66.9	20.5	17.0	37.5	55.3	-17.8	Peak	Vertical
7791.5	50.7	-6.8	43.9	55.3	-11.4	Peak	Horizontal
9653.0	48.8	-5.2	43.6	55.3	-11.7	Peak	Horizontal
8599.0	48.6	-6.2	42.4	55.3	-12.9	Peak	Vertical
10256.5	48.7	-5.2	43.5	55.3	-11.8	Peak	Vertical
Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).							
Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)							

5.8. End User Device Additional Requirement (CBSD Protocol)

5.8.1.Test Limit

End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by aCBSD, including the frequencies and power limits for their operation.

An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD

5.8.2.Test Procedure

KDB 940660 D01 v02, WINNF-TS-0122 V1.0.2

5.8.3.Test Setting

The EUT was connected via an RF cable to a certified CBSD (Ruckus Wireless, Inc. FCC ID: S9GQ910US00) and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRS CBSD Test Specification.

Step 1:

a. Setup WINNF.PT.C.HBT.1 with 3570 ~ 3590MHz and power level at 13 dBm/MHz.

b. Enable AP service from Ruckus LTE Cloud management.

c. Check EUT Tx frequency and power.

d. Disable AP service from Ruckus LTE Cloud management and check EUT stop transmission within 10s.

Step 2:

a. Setup WINNF.PT.C.HBT.1 with 3670 ~ 3690MHz and power level at 8 dBm/MHz.

b. Enable AP service from Ruckus LTE Cloud management.

c. Check EUT Tx frequency and power.

d. Disable AP service from Ruckus LTE Cloud management and check EUT stop transmission within 10s.

5.8.4.Test Result

Product	LTE Module	Test Site	WZ-SR6
Test Engineer	Larry Yan	Test Date	2021/11/22
Test Mode	CBSD transmit at 3580MHz (20MHz BW), 13dBm/MHz		

Frequency Operation	Discontinues Operations within 10s
	

Marker 1: CBSD sends instructions to discontinue LTE operations.

Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

Product	LTE Module	Test Site	WZ-SR6
Test Engineer	Larry Yan	Test Date	2021/11/22
Test Mode	CBSD transmit at 3680MHz (20MHz BW), 8dBm/MHz		

Frequency Operation	Discontinues Operations within 10s
	

Marker 1: CBSD sends instructions to discontinue LTE operations.

Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

6. CONCLUSION

The data collected relate only the item(s) tested and show that unitis compliance with FCC Rules.

Appendix A - Test Setup Photograph

Refer to “2110RSU029-UT” file.

Appendix B - EUT Photograph

Refer to “2110RSU029-UE” file.